Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] What is claimed is:

1. A spindle motor comprising:

a shaft;

a unilaterally open-ended cylindrical bearing member having a bearing hole into which said shaft is inserted and a closed-end surface axially opposing the inserted-end face of said shaft;

a rotor that rotates together with said shaft and has a circular flat face extending radially outward from the circumferential surface of said shaft;

a series of bearing clearances filled with oil, formed in between said bearing member, and said shaft and the flat face of said rotor;

a thrust bearing section provided with dynamic-pressure-generating grooves contoured to impart on the oil pressure acting radially inward during rotation of said rotor, and formed in between the flat face of said rotor and an end face of said bearing member axially opposing the rotor flat face;

a radial bearing section provided with dynamic-pressure-generating grooves contoured to impart on the oil pressure acting inward from either end axially during ro-

tation of said rotor, and formed in between an inner peripheral surface of said bearing hole and a circumferential surface of said shaft radially opposing the bearing-hole inner peripheral surface; and
at least one ray-like groove provided in the bearing member end face where said thrust bearing section is formed, and reaching from a radially inward edge portion of the dynamic-pressure-generating grooves provided in said thrust bearing section to said bearing hole.

[c2] 2. A spindle motor as set forth in claim 1, wherein:
said bearing member is composed of a hollow cylindrical sleeve in which said bearing hole is provided, said sleeve therein having an end face where said thrust bearing section is formed, and a cup-shaped bearing housing one end of which is closed over, for retaining said sleeve;
the dynamic-pressure-generating grooves in said thrust bearing section are formed in the other end of said bearing housing; and
said ray-like groove is formed in said end face of said sleeve.

[c3] 3. A spindle motor as set forth in claim 1, wherein:
spiral grooves having a pump-in contour are provided as said dynamic-pressure-generating grooves in said thrust bearing section;
said radial bearing section is axially separated twin con-

stituents between the circumferential surface of said shaft and the inner peripheral surface of said bearing hole;

herringbone grooves in an axially unbalanced conformation are provided as said dynamic-pressure-generating grooves in at least either one of the twin constituents of said radial bearing section, for pressuring the oil toward the closed end of said bearing member from along the open end thereof; and

a hydrostatic bearing employing the dynamic pressure generated in the thrust bearing section and radial bearing section is formed in between the inserted-end face of said shaft and the closed end of said bearing member.

[c4] 4. A spindle motor as set forth in claim 1, wherein a ray-like groove is provided in the inserted-end face of said shaft, reaching from the axial center of said shaft to the perimetric edge of said end face.

[c5] 5. A spindle motor as set forth in claim 2, an encircling chamfer being provided circumferentially on the end face of said sleeve along the thrust bearing section, wherein at least one projection is arranged within a gap formed in between the chamfer and said bearing housing.

[c6] 6. A spindle motor as set forth in claim 2, wherein said sleeve is installed so as to protrude beyond said bearing

housing toward the flat face of said rotor.

[c7] 7. A spindle motor as set forth in claim 2, wherein a communicating passage is formed in between the outer circumferential surface of said sleeve and the inner peripheral surface of said bearing housing with one end of said communicating passage opening on said thrust bearing section radially inwardly therein, and with either axial end of a one of said bearing clearances being formed in between the inner peripheral surface of said bearing hole and the circumferential surface of said shaft communicating through said passage, for balancing pressure within said bearing clearances.

[c8] 8. A spindle motor as set forth in claim 2, further comprising:
a cylindrical wall provided on said rotor, depending from the flat face thereof and radially opposing across a gap the circumferential surface of said bearing housing;
a tapered face that shrinks diametrically according as its outer diameter is away from the flat face of said rotor, provided on the circumferential surface of said bearing housing; wherein
the oil forms and retains a meniscus between said tapered face and the inner peripheral surface of the cylindrical wall.

[c9] 9. A spindle motor as set forth in claim 8, wherein:
a stepped portion is provided on said bearing housing where its circumferential surface continuous with said tapered face is recessed radially inward;
a radially inward-projecting annular member corresponding to said stepped portion is affixed to the inner peripheral surface of said cylindrical wall on said rotor, and engagement between said stepped portion and said annular member constitutes a retainer for said rotor; and
a micro-gap smaller than the minimum clearance dimension of the radial gap formed in between said tapered face of said bearing housing and the inner peripheral surface of said cylindrical wall on said rotor is formed in between an upper face of said annular member and an undersurface of said stepped portion, functioning as a labyrinth seal.

[c10] 10. A disk drive in which is mounted a disk-shaped recording medium onto which information is recordable, the disk drive including a housing; a spindle motor fixed within said housing, for spinning the recording medium; and an information accessing means for writing information into and reading information from requisite locations on said recording medium; the disk drive characterized in that said spindle motor comprises:
a shaft;

a unilaterally open-ended cylindrical bearing member having a bearing hole into which said shaft is inserted and a closed-end surface axially opposing the inserted-end face of said shaft;

a rotor that rotates together with said shaft and has a circular flat face extending radially outward from the circumferential surface of said shaft;

a series of bearing clearances filled with oil, formed in between said bearing member, and said shaft and the flat face of said rotor;

a thrust bearing section provided with dynamic-pressure-generating grooves contoured to impart on the oil pressure acting radially inward during rotation of said rotor, and formed in between the flat face of said rotor and an end face of said bearing member axially opposing the rotor flat face;

a radial bearing section provided with dynamic-pressure-generating grooves contoured to impart on the oil pressure acting inward from either end axially during rotation of said rotor, and formed in between an inner peripheral surface of said bearing hole and a circumferential surface of said shaft radially opposing the bearing-hole inner peripheral surface; and

at least one ray-like groove provided in the bearing member end face where said thrust bearing section is formed, and reaching from a radially inward edge por-

tion of the dynamic-pressure-generating grooves provided in said thrust bearing section to said bearing hole.

[c11] 11. A disk drive as set forth in claim 10, wherein:
said bearing member is composed of a hollow cylindrical sleeve in which said bearing hole is provided, said sleeve therein having an end face where said thrust bearing section is formed, and a cup-shaped bearing housing one end of which is closed over, for retaining said sleeve;
the dynamic-pressure-generating grooves in said thrust bearing section are formed in the other end of said bearing housing; and
said ray-like groove is formed in said end face of said sleeve.

[c12] 12. A disk drive as set forth in claim 10, wherein:
spiral grooves having a pump-in contour are provided as said dynamic-pressure-generating grooves in said thrust bearing section;
said radial bearing section is axially separated twin constituents between the circumferential surface of said shaft and the inner peripheral surface of said bearing hole;
herringbone grooves in an axially unbalanced conformation are provided as said dynamic-pressure-generating grooves in at least either one of the twin constituents of said radial bearing section, for pressuring the oil toward

the closed end of said bearing member from along the open end thereof; and

a hydrostatic bearing employing the dynamic pressure generated in the thrust bearing section and radial bearing section is formed in between the inserted-end face of said shaft and the closed end of said bearing member.

[c13] 13. A disk drive as set forth in claim 10, wherein a ray-like groove is provided in the inserted-end face of said shaft, reaching from the axial center of said shaft to the perimetric edge of said end face.

[c14] 14. A disk drive as set forth in claim 11, an encircling chamfer being provided circumferentially on the end face of said sleeve along the thrust bearing section, wherein at least one projection is arranged within a gap formed in between the chamfer and said bearing housing.

[c15] 15. A disk drive as set forth in claim 11, wherein said sleeve is installed so as to protrude beyond said bearing housing toward the flat face of said rotor.

[c16] 16. A disk drive as set forth in claim 11, wherein a communicating passage is formed in between the outer circumferential surface of said sleeve and the inner peripheral surface of said bearing housing with one end of said communicating passage opening on said thrust bearing

section radially inwardly therein, and with either axial end of a one of said bearing clearances being formed in between the inner peripheral surface of said bearing hole and the circumferential surface of said shaft communicating through said passage, for balancing pressure within said bearing clearances.

[c17] 17. A disk drive as set forth in claim 11, further comprising:
a cylindrical wall provided on said rotor, depending from the flat face thereof and radially opposing across a gap the circumferential surface of said bearing housing;
a tapered face that shrinks diametrically according as its outer diameter is away from the flat face of said rotor, provided on the circumferential surface of said bearing housing; wherein
the oil forms and retains a meniscus between said tapered face and the inner peripheral surface of the cylindrical wall.

[c18] 18. A disk drive as set forth in claim 17, wherein:
a stepped portion is provided on said bearing housing where its circumferential surface continuous with said tapered face is recessed radially inward;
a radially inward-projecting annular member corresponding to said stepped portion is affixed to the inner peripheral surface of said cylindrical wall on said rotor,

and engagement between said stepped portion and said annular member constitutes a retainer for said rotor; and a micro-gap smaller than the minimum clearance dimension of the radial gap formed in between said tapered face of said bearing housing and the inner peripheral surface of said cylindrical wall on said rotor is formed in between an upper face of said annular member and an undersurface of said stepped portion, functioning as a labyrinth seal.